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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/758,473	01/15/2004	Gregory Edward Tierney	200313751-1	6097

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FORT COLLINS, CO 80527-2400

EXAMINER

DINH, NGOC V

ART UNIT	PAPER NUMBER
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2189

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/11/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/758,473	Applicant(s) TIERNEY ET AL.	
	Examiner NGOC V. DINH	Art Unit 2189	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13-23 is/are allowed.
- 6) ☒ Claim(s) 1,4-12,24-32 and 34 is/are rejected.
- 7) ☒ Claim(s) 2,3,33 and 35 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 January 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>01/15/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is a response to the U.S. application Serial No. 10/758473 filed 01/15/04. Claims 1-35 are presented for examination.

INFORMATION DISCLOSURE STATEMENT

2. The Applicant's submission of the IDS filed 08/11/2003 have been reviewed. However, the only documents that have not been considered are: 2Q, 2R as they do not have the date, and 1Q, 1S as they do not have month/year. As required by M.P.E.P. 609 C(2), a copy of the PTOL-1449 is attached to the instant office action.

SPECIFICATION

3. The Applicant is reminded to update the status of the applications on page 1 of the specification appropriately. The Applicant should provide the US application No. for Attorney docket No. 200313752-1 when response to this office action.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 1, 24-26, 28-32 are rejected under 35 U.S.C.102 (e) as being anticipated by Conway et al. PN 6,766,360.

Conway teaches:

Per claims 1, 24: a multi-processor system comprising: a requesting node [requesting node, col. 3/line 4, or processor 16, fig. 1, col. 5/25-30] that provides a first request for data to a home node [RAC, fig. 1, col. 6/29-35] the requesting node being operative to provide a second request [and

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issues a second request 2a to the director 60, fig. 1] for the data to at least one predicted node [for the group B(40) for the remote home node 42, col. 6/34-40] in parallel [simultaneously issues a first request,... and issues a second request 2a, col. 6/34-38; issuing simultaneously two requests, col. 2/60-62; the “read-to-shared” request from the first processor is issued to the RAC and is also simultaneously issued to the remote home node, col. 3/8-11] with first request, the requesting node receiving at least one coherent copy [shared state, col. 7/1-7, if the cache line is present in the RAC, , then it is in the shared state] of the data [shared state, col. 7/10-28] from at least one of the home node and the at least one predicted node [fig. 1; col. 6/25-60; col. 7/1-30].

Per claims 25, 30-32: Conway inherently teaches:

Conway teaches: means for ascertaining whether an owner node has an exclusive cached copy of the requested data [MESI, col. 5/34-35]..

Inherently Conway teaches:

means for providing a third request for the data from the owner node to the home node when the owner node has the exclusive cached copy of the requested data. This is because according to the coherency protocol, if the requested data is Exclusively owned by a node (owner node), the requested data is only owned by this owner node and no other node has the ownership of this data. Therefore, the requesting node must send the request to the owner node to obtain that data exclusively owned by the owner node.

b) Providing the coherent copy of the requested data in response to the second request when owner node receives the second request prior to the third request. Providing the coherent copy of the requested data in response to the third request when owner node receives the third request prior to the second request. This is because servicing requests is based on first in first out basis.

Per claim 26, the means for providing the coherent copy of the requested data comprises one of (i) the home node, in response to the first request, when no exclusive cached copy of the requested data exists [coherency protocol, if cache line is in M, S, I then any other node can provide this cache line if cache hit is present in that node; if the data is E then data may be supplied when the state of the line is downgraded from E to S, col. 5/45-55].

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Inherently, Conway teaches: and (ii) the owner node, in response to one of the second request and the third request, when the owner node has the exclusive cached copy [see claim 25 above] of the requested data.

Per claim 28, Conway teaches: means for changing a state of the cached copy of the requested data at the owner node in response to providing the response that includes the coherent copy of the requested data from the owner node to the requester [the state of the line is downgraded from E to I, when the cache line is supplied, col. 5/50-55].

Per claim 29, Conway teaches the claimed limitations as mentioned above. Conway inherently teaches: receiving at least one coherent copy of the block of data at the requester from an owner node, if the owner node has an exclusive cached copy of the block of data, and from the home node, if no exclusive cached copy of the block of data exists when the home node receives the first request [see claims 25-26 above].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 4-6, 8-9, 12 are rejected under 35 U.S.C 103(a) as being unpatentable over Conway, and in view of Jim Handy, "The Cache Memory Book".

Per claim 4, Conway does not teach a cached copy of the data exists in the system, the home node issuing a third request for the data to an owner node having the cached copy of the data. Jim Handy teaches when the cache containing the updated copy snoops this read cycle (**ownership protocols**), it will supply the data to the requesting processor. Jim Handy further

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teaches the MOESI protocol, wherein the cache updates the line either from main memory or from the owning cache [Jim Handy, page 153, line 29 to page 154 line 24; page 169, MOESI protocol].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Jim Handy to Conway in order to maintain ownership protocols (cache coherency) between caches in each node and to ensure the requesting node will have the up-to-dated data. [Jim Handy, page 153].

Per claim 6, Conway does not teach the owner node provides a response to one of (i) the home node and (ii) the home node and the requesting node, the owner node providing the response based on a state of the cached copy of the data at the owner node.

However, such would have been obvious to combine to Conway for the same reasons stated above.

Per claim 9. Conway does not teach the at least one predicted node comprises the owner node having an exclusive cached copy of the data, the owner node providing a data response to the requesting node based on which of the second request and the third request arrives at the owner node first.

However, such would have been obvious to combine to Conway for the same reasons stated above.

Per claim 12, Conway further teaches the at least one predicted node [group b(40), see claim 1] further comprises a target node [Node B1, B2] having a cache that includes the data having one of an invalid state and a shared state [MESI, col. 5/32-35] the at least one predicted node providing a miss response to the requesting node in response to the second request [col. 6, 34-55] Conway does not teach the owner node providing a data response to the requesting node in response to the third request.

However, However, such would have been obvious to combine to Conway for the same reasons stated above.

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Per claims 5, 8: Conway does not teach the system employs a directory-based cache coherency protocol, the home node further comprising a directory that maintains directory state information associated with the data, the home node issuing the third request to the owner node based on the directory state information indicating that the owner node has an exclusive cached copy of the data.

Jim Handy teaches maintaining cache coherency in a multi-processor system using the directory-based coherency [page 148, line 15 to page 149 line 10].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Jim Handy to Conway in order to maintain cache coherency [Jim Handy, page 148, lines 1-6].

6. Claim 7 is rejected under 35 U.S.C 103(a) as being unpatentable over Conway, in view of Jim Handy, and further in view of Natsume et al. PN 6,523,138.

Per claim 7, Conway does not teach requesting node provides the first request to the home node in a request channel and the second request to the at least one predicted node in a forward channel, the home node issuing the third request to the owner node in the forward channel, and each of the owner node and the at least one predicted node providing a respective response in a response channel.

Natsume teaches a processing system comprising multi channel processors for different requests [col. 4/1-10; fig. 1].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Natsume to Conway to provide different channels for different requests and returned data so that if a channel becomes faulty, other channel can be provided for continuously use [col. 4/1-10] and also bus contention is reduced.

7. Claims 10-11 are rejected under 35 U.S.C 103(a) as being unpatentable over Conway, in view of Jim Handy, and further in view of Shanahan et al. PN 6,961,827.

Per claims 10-11: Conway-Jim Handy does not teach the owner node provides a victim message to the home node after providing data to the home node, and the home node provides an acknowledgement of receiving the data.

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Shanahan teaches the owner node provides a victim message [victim invalidation message, col. 3/55-60] to the home node after providing data to the home node, and the home node provides an acknowledgement of receiving the data [col. 10/45-50].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Shanahan to Conway so that victim invalidation message may improve the overall performance of the processor-based system [col. 3/57-62].

8. Claims 27, 34 are rejected under 35 U.S.C 103(a) as being unpatentable over Conway, in view of Shanahan et al. PN 6,961,827.

Per claims 27, 34: Conway does not teach the owner node provides a victim message to the home node after providing data to the home node, and the home node provides an acknowledgement of receiving the data.

Shanahan teaches the owner node provides a victim message to the home node after providing data to the home node, and the home node provides an acknowledgement of receiving the data (see claims 10-11 above).

However, such would have been obvious to combine to Conway for the same reasons stated above.

Allowable Subject Matter

9. Claims 13-23 are allowed. The primary reasons for allowance of claims 13-23 in the instant application is the combination with the inclusion of at least the limitations set forth in lines 7-10 of the claim.

Claims 2-3, 33, 35 are objected to as being dependent upon a rejected base claims, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. **Any response to this action should be mailed to:**

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Under Secretary of Commerce for intellectual Property and Director of the
United States Patent and Trademark Office

PO Box 1450

Alexandria, VA 22313-1450

or faxed to:

(571) 273-8300, (for Official communications intended for entry)

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PMR) system. Status information for published Applications may be obtained from either Private PMR or Public PMR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pak-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc Dinh whose telephone number is (571) 272-4191. The examiner can normally be reached on Monday-Friday 8:30 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Reginald Bragdon, can be reached on (571) 272-4204.

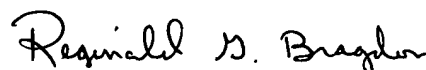


NGOC DINH

Patent Examiner

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December 28, 2006



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